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INCENSE-CEDAR

. . . *an American wood*

The wood of incense-cedar is lightweight, soft, straight grained, and uniform in texture. It has a spicy aromatic odor and outstanding durability, dimensional stability, and insulative qualities. It is used extensively in residential and industrial structures for exterior siding, sheathing, and subflooring. The wood is ideal for interior siding and closet lining. It is widely used for pencils. The recent use of mill residue for pulp, and poor quality material for backyard fencing, augur well for increased utilization of this species.

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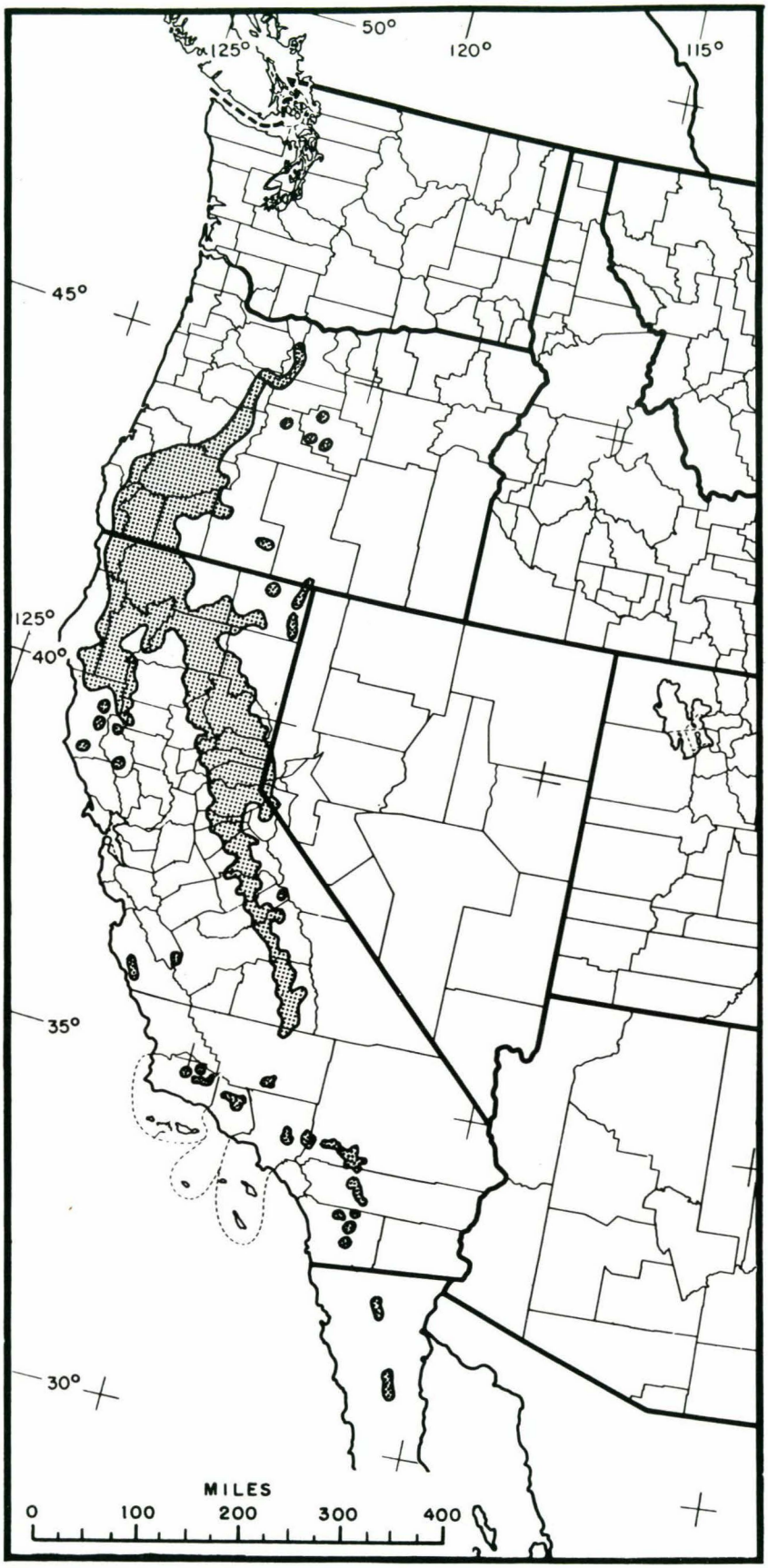

Figure 1.—Natural range of incense-cedar. F-506603

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INCENSE-CEDAR

. . . an American wood

Philip M. McDonald [1]

DISTRIBUTION

The range of incense-cedar (*Libocedrus decurrens* Torr.) extends from the southern slope of Mount Hood in Oregon southward to the mountains of Baja California (fig. 1). The species grows in the Coast Range, Cascade Range, and Klamath Mountains in Oregon, and in the Coast Range and Sierra Nevada in northern and central California. It also extends into west-central Nevada near Lake Tahoe in the Washoe Mountains. In southern California, it is found in the Transverse and Peninsular Ranges, and in Baja California in the Hanson Laguna and San Pedro Martir mountain ranges.

Adaptability is the key to the distribution of incense-cedar. This species is found on sites ranging from arid, glaring ridegetops to moist, shady brooksides, from low to high elevations, and from deep soils to shallow pockets of pulverized rock. Within its natural range it is limited only by extreme drought, excessive humidity, and conditions prevalent at the timberline.

Incense-cedar grows in a climate where precipitation varies from 15 to 95 inches annually. This variability is further accentuated by uneven moisture distribution within each year. Typically, little or no rain falls during June, July, August, or even September. Most rainfall occurs during December and February, although December through March can be months of heavy precipitation. Temperatures range from –20 degrees F. to 105 degrees F.

Elevational limits generally increase from north to south as lack of adequate moisture and debilitating temperatures force incense-cedar to higher elevations. In Oregon, the species does well at about 1,500 feet, grading to 5,000 feet in the northern Sierra Nevada, 7,000 feet in the southern Sierra Nevada, and 8,000 feet in Baja California.

Incense-cedar grows on nearly every soil, including serpentine, provided good internal drainage exists. It does best on level flats or gentle slopes where the soils are deep, well drained, and of medium texture. Often its conifer associates crowd it off the better sites, relegating it either to edaphic islands, as in the case of serpentine, or to physiographic badlands that are rocky, arid, and steep.

DESCRIPTION AND GROWTH

Within its natural range, incense-cedar is a picturesque component of the flora. Its widely buttressed base, deeply fluted cinnamon bark, and tapering bole, stand out strongly among its coniferous associates (fig. 2). It commonly reaches a height of 80 to 100 feet, a diameter breast height (d.b.h.) of 4 to 5 feet, and an age of 500 years. A few trees reach exceptional proportions of 150 feet in height, 9 feet in diameter, and 900 years of age. The old monarchs often have crowns which are broken and irregular with only a few scattered branches on the upper bole. Sometimes the top is dead, but the trees live by a few or even a single upturned branch with its dense tuft of foliage. Young trees up to 12 inches d.b.h. have a reddish scaly bark and often carry many small branches which clothe the stem to the ground. Together the branches form a symmetrical cylinder of foliage which evenly tapers to a spirelike top. The limber, spreading branches grow at right angles to the bole usually with a slight upward thrust at the terminals. Each branch contains many twigs (fig. 3), which form horizontal sprays of foliage if in deep shade, or nearly vertical sprays if open grown. Trees of all ages are remarkably wind firm.

Rarely does incense-cedar grow in pure stands (fig. 4). Some stands or groves seem pure, but close examination will reveal stumps of the more valuable pine and fir, long since logged away. The species is rarely a major component of any forest cover type in which it occurs. Common coniferous associates are ponderosa pine, Douglas-fir, sugar pine, white fir, and giant

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NOTE.—This publication supersedes unnumbered *Incense-Cedar*, issued 1955.

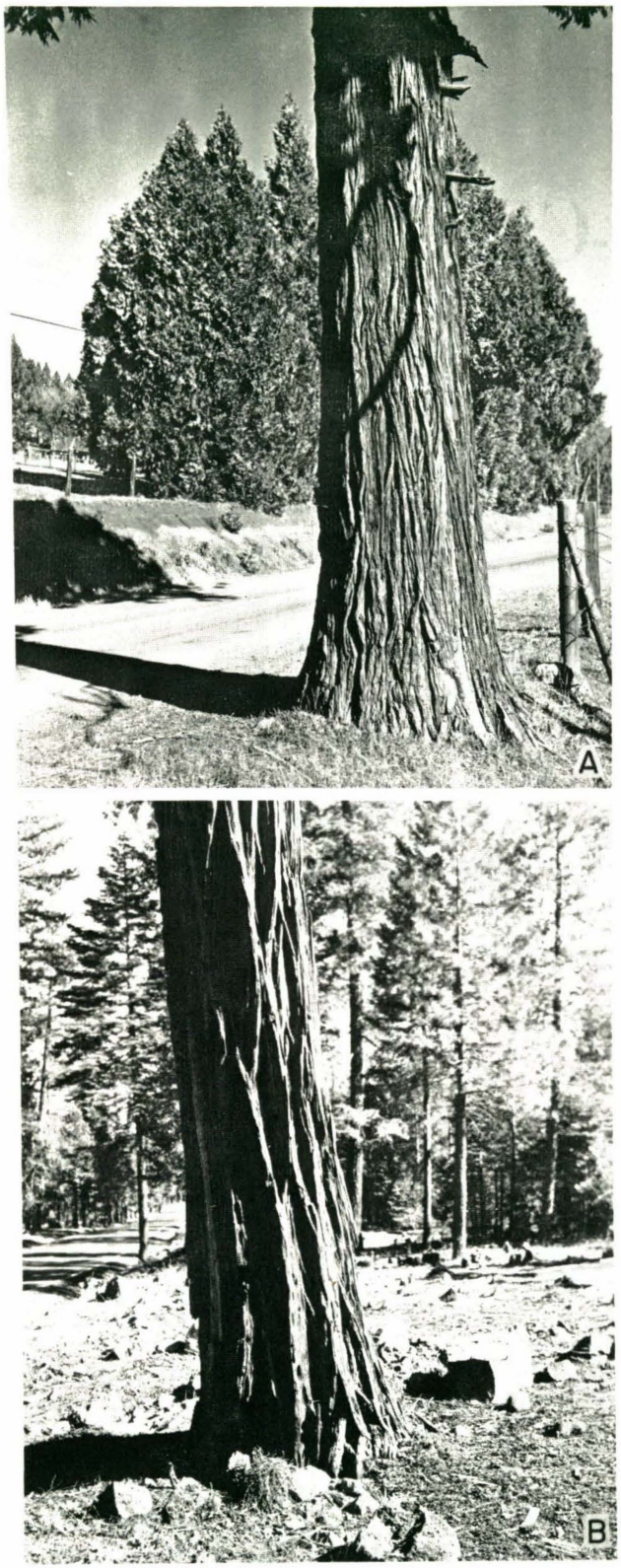

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Figure 2.—Typical bark of mature (A) and overmature (B) incense-cedar.

sequoia. Hardwood companions are California black oak, Pacific madrone, and tanoak. In south-central Oregon and along the lower fringe of its range, incense-cedar shares the site with California black oak, Pacific madrone, other oaks, and numerous kinds and amounts of brush.

In many cases the species is subordinate to its coniferous associates and thus is a large component of the intermediate- and suppressed-crown classes. Seldom does it contribute more than 30 percent to the dominant and codominate classes. Trees of this species generally grow slower than other conifers with which they mingle. When open-grown on poor sites, however, incense-cedar up to 24 inches d.b.h. can exceed all other species, except white fir, in basal-area growth. On other sites, incense-cedar trees generally fall behind and are forced to endure more and more shade. This condition further slows their growth to the point of bare existence. On such trees, 40 annual rings per inch of diameter are not uncommon.

The lower branches, being shade tolerant, remain alive for many years. They also persist for years when dead, and form numerous small knots deleterious to lumber quality.

The cones are ¾ to 1½ inches long, are light green until ripe in September, yellowish brown when shedding seed, and reddish brown when dry and open. Most cones fall during winter, but some adhere to the branches until spring. Individual seeds average about 15,000 per pound. They possess a disproportionately large wing for their weight and consequently are wafted great distances by air currents. Each has resin chambers filled with a reddish balsamic liquid within the inner

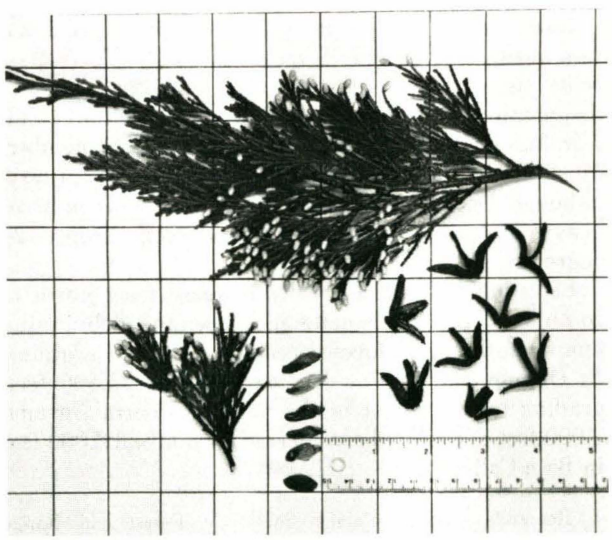

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Figure 3.—Foliage, cones, and seeds of incense-cedar. Staminate flowers are on twig terminals.

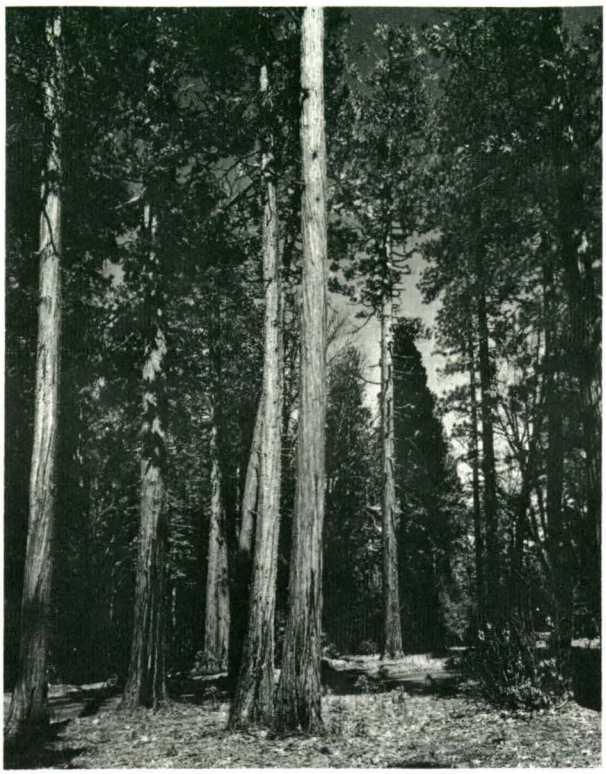

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Figure 4.—Typical grove of mature incense-cedar.

seed coat. This substance helps make the seed repugnant to rodents and aids in regeneration.

Prodigious amounts of seed are produced when incense-cedar has an abundant seed crop. These crops occur about every 3–4 years and can result in as much as 380,000 seeds per acre. Soundness varies greatly, with about 40 percent being a rough average. The seeds germinate readily on nearly any moist surface. But survival is best on both organic and mineral soil under partial shade. Here, dense carpets of seedlings are found occasionally. On compacted areas, germination is usually in vain.

Other than fire or man, only one natural enemy greatly affects incense-cedar. It is a fungus, *Polyporus amarus* Hedgc., which enters the tree through large open knots or wounds of all kinds and attacks the heartwood. Over-mature trees often have their heartwood riddled with cavities, and cull based on gross volume can reach 66 percent from this pest alone. Trees less than 150 years old are not usually attacked.

COMMON NAMES

In the early literature, the tree was called California incense-cedar—a name used extensively. Other common names were white, pecky, bastard, and California post cedar. These all fell from favor, and today incense-cedar is the only name commonly used.

RELATED COMMERCIAL SPECIES

This species grows and is logged in conjunction with its mixed-conifer associates and rarely as an individual species. Existing grading rules allow it to be sold as western cedar, which can be a combination of western red cedar and incense-cedar or all of either species. Furthermore, it is sometimes combined with several other conifer species and sold in board grades of mixed species or mixed white goods, which allow any percentage of incense-cedar. These latter designations often permit the retailer to realize a bonus by sorting out the incense-cedar which normally has a much greater market value, grade-to-grade, than other western softwoods. As a whole, these categories (western cedar, mixed species, etc.) tend to mask the supply, production, and use of incense-cedar.

SUPPLY

The estimate of incense-cedar sawtimber volume has varied apreciably over the years, probably because of lack of accurate data. Estimates in 1918 listed 11 billion board feet in California and another billion in Oregon. A 1945 estimate, which seems more accurate, listed 7.4 billion board feet in California, 2.3 billion board feet in Oregon, and a small volume in Nevada. In 1955, the supply rose to 9.7 billion board feet in California and 3.6 billion in Oregon and Nevada. Data for 1963 showed 4.8 billion board feet of sawtimber in Oregon, 8.2 billion board feet in California, and 12 million board feet in Nevada. About 2.6 billion board feet of growing stock were estimated in the three States in 1963. The supply has probably changed only slightly since then.

PRODUCTION

Because of its resistance to decay, early pioneers and gold miners used the species for portions of their structures in contact with the ground. Extensive fluming was also commonplace in the 1860's and 1870's in the gold-mining regions. Incense-cedar was the preferred species for the flumes. An averaged-sized flume utilized about 135,000 board feet per mile, so incense-cedar production increased appreciably during construction years. But because incense-cedar was only a minor stand component, its logging also was a minor activity. Thus lumber production was erratic and in small amounts relative to its coniferous associates.

Since the early 1940's, production of incense-cedar has been on the rise. During World War II, production increased to 30 million board feet per year. After the war, it averaged about 70 million board feet annually. In 1956, the production of incense-cedar in California was 104 million board feet or about 2 percent of the State's total softwood production. Incense-cedar com-

prised 3 percent of California's lumber production or about 146 million board feet in 1968. In the same year, production was 0.4 percent of Oregon's lumber production or about 33 million board feet.

When the supply of eastern redcedar ended in the early 1900's, the pencil manufacturers turned to incense-cedar. In 1956, nearly all wood—98 percent—used for pencils in the United States was incense-cedar.

About 20,000 tons of ovendry incense-cedar chips were used for pulp in California in 1969. Future use is expected to increase slightly.

CHARACTERISTICS AND PROPERTIES

The sapwood of incense-cedar is white or cream colored. The heartwood is often light brown or light reddish brown, and is aromatic, spicy, smooth, and glistening. It is the heartwood with its outstanding resistance to decay which gives the wood of incense-cedar widespread use in a variety of lumber products. Requiring no preservatives against decay, it can be used safely in the wettest of conditions. Sapwood, on the other hand, is susceptible to decay, but is easily treated with many standard preservatives.

The amount of heartwood in a tree often varies greatly because of differences in age, diameter, crown class, and crown width. But because the heartwood is more valuable than the sapwood, and also has a different moisture regime when seasoned, it is important to know how much heartwood is present. Recent tests have shown that heartwood percentage is highly correlated to the diameter of a horizontal slice, or disc, regardless of the height at which the disc is sawn from the tree. The higher after-seasoning moisture content of incense-cedar heartwood, relative to sapwood, likely results from the quantity of extraneous materials present in the heartwood cells.

Incense-cedar is ranked by the Forest Products Laboratory (USDA Forest Service) with woods which hold paint longest and suffer least when the paint finally breaks down. This characteristic is due partially to its nonresinous nature and fine, uniform texture of small, evenly arranged cells. In addition, the wood often is remarkably straight grained.

Incense-cedar wood has another outstanding characteristic which endears it to lumbermen—high dimensional stability. When dried from green to 12-percent moisture content, its volumetric shrinkage is only 3.8 percent. Radial and tangential shrinkages also are low. Thus the wood is easy to season with little warping or checking. A low coefficient of thermal conductivity is another of its attributes. It serves well in structures that are kept dry but subjected to considerable temperature fluctuations.

In terms of workability with handtools, incense-cedar ranks near the top. It also machines well and forms smooth even surfaces. It is easy to glue under a wide range of conditions. Nail-holding ability is considered good relative to its lightweight (24 pounds per cubic foot at 12-percent moisture content). But blunt-pointed nails should be used to avoid splintering the wood.

When subjected to various solvents, the heartwood of incense-cedar yields a rich harvest of extractive substances. These amount to 15 percent of the heartwood on a dry weight basis. The bark contributes 20 percent and the sapwood about 3 percent. Many extracts from the heartwood have been found to be strong fungicides which are partially responsible for the heartwood's decay resistance.

In tests of the pulping capability of incense-cedar, the wood was found to yield a fairly good grade of paper, although it is dark in color and difficult to bleach. Incense-cedar chips, in mixture with chips of other species, are being used by a pulpmill in north central California for wadding products having a large absorptive capacity. The incense-cedar chips are from slabs and other mill residue and hence are primarily from the sapwood. In one test where a majority of the chips were from the heartwood, difficulties in pulping arose.

Incense-cedar wood is rated moderately-low to low in strength, shock resistance, stiffness, and hardness. The sapwood differs significantly in specific gravity from the heartwood: 0.35 and 0.38, respectively.

PRINCIPAL USES

Because of its outstanding durability and resistance to decay, incense-cedar is used extensively where humidity is high or moisture is ever present. For example, the species is ideal for sheathing under stucco or brick-veneer construction where condensation is always high. Mudsills, rafters, window sashes, greenhouse benches, nursery flats, and boardwalks are just a few uses where this wood gives lasting service with little maintenance. Grave linings and casket shook are among its unique uses.

Durability, fine dimensional stability, and high insulation quality make incense-cedar ideal for exterior siding where it is used extensively. These properties and its weathering ability adapt it well for log-cabin siding. Its ready paintability and smooth surfaces after machining further enhance its use as siding. Incense-cedar sheathing and subflooring are particularly desirable in home and industry. Often, interior heating equipment or moisture in the ground cause alternate drying and condensation plus strong temperature variations. Therefore, wood for sheathing and subflooring must be able to withstand such changes.

Rich color, sound knots, and aromatic fragrance entice many homeowners to use incense-cedar for in-

terior paneling and woodwork. Increasingly popular is natural and routed pecky-cedar paneling. Incense-cedar is also used for closet lining.

This species is ideally suited to the manufacture of pencils because of its softness, ease of whittling, and straightness of grain. Much of the top grade lumber produced goes to this use. These properties and the lightweight and workability of incense-cedar account for its use in toys, "mothproof" chests, novelties, and other specialty products.

Straight grain and durability combine to furnish a host of products to the farmer and orchardist, such as fenceposts, rails, poles, grape stakes, trellises, feed troughs, and farm outbuildings. The ranch-style suburban home emphasizes backyard fencing and has opened up a new and rapidly growing market for poor quality, fungus-riddle grades of incense-cedar which formerly were not utilized. This use plus chips for pulp, should increase the future utilization of incense-cedar as a whole.

The species is cultivated as an ornamental tree in western and central Europe, where it grows quite well. Occasionally it is planted in the mid-Atlantic and New England States. In California and Oregon, it adorns many rural and ranch-style homes.

The wood is used for railroad ties, shingles, and fuelwood, but the extent of use is unknown.

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